National Park Service
U.S. Department of the Interior

Great Basin National Park
Nevada

WILD CAVES AND KARST MANAGEMENT PLAN

Environmental Assessment

July 2019

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Abbreviations and Acronyms

ARPA – Archeological Resources Protection Act
BLM – Bureau of Land Management
CEQ - Council on Environmental Quality
DOI – Department of Interior
EA – Environmental Assessment
ESA – Endangered Species Act
GMP – General Management Plan
GRBA – Great Basin National Park
NEPA – National Environmental Preservation Act
NHPA – National Historic Policy Act
NPS – National Park Service
NRCS – Natural Resources Conservation Service
NRHP – National Register of Historic Places
NSS – National Speleological Society
PPE – Personal Protective Equipment
SHPO – State Historic Preservation Office
SNPLMA – Southern Nevada Public Lands Management Act
UCLA – University of California, Los Angeles
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
USGS – United States Geologic Survey
WACC – Western Archeological Conservation Center

INTRODUCTION

Great Basin National Park is proposing to implement a plan for management of wild caves and karst. This plan protects geologic features, hydrologic processes, biological species, ecological processes, and paleontological and archeological features. Other items in the plan would expand cave education and outreach, encourage more research in the caves, and allow for recreational caving in selected caves. A separate Lehman Caves Management Plan deals with just that cave, and is a separate plan due to the developed nature of that cave and the different management challenges facing it.

For specific projects mentioned in this document, but not fully described nor assessed for impacts, site and/or project-specific environmental compliance will be completed in the future as appropriate.

BACKGROUND

Approximately 40 caves are known to occur within Great Basin National Park (GRBA; Figure 1), as well as extensive karst areas (Figure 2). Many of these caves were managed by the US Forest Service until the park was established in 1986. Several of the caves have been found in recent years. GRBA contains the longest (2 miles), deepest (436 feet), and highest elevation (over 11,000 feet) caves in the state of Nevada.

The Park encompasses over 77,000 acres of the South Snake Range, which is in east-central Nevada. The nearest large cities are Salt Lake City, Utah, 234 miles to the northeast, and Las Vegas, Nevada, 291 miles to the southwest. The park is surrounded by land managed by the Bureau of Land Management (BLM) and private land.

PURPOSE

The purpose of developing a Wild Caves and Karst Management Plan (WCKMP) is to protect and preserve the wild caves in the park, while allowing for respectful use of them. The duration of the plan is 15-20 years, although adjustments may be made as determined by the adaptive management process.

NEED

By completing this plan, GRBA will meet NPS guidelines of having an approved cave management plan for the park. National Park Service policy directs parks to develop cave management plans to uphold its mission to protect and preserve park resources for current and future generations to experience and enjoy. The Park’s General Management Plan (NPS 1991) calls for a cave management plan to be prepared for all cave and cave resources in the park. The Great Basin National Park Foundation Document (NPS 2015) was written to provide basic guidance for planning and management decisions. One of the fundamental resources identified in the document was caves, karst, and cave-forming processes. Geology, hydrology, biology, paleontology, and archeology are also called out. The Foundation Document notes that the park has limited cave management guidance and calls for the development of a cave and karst management plan.

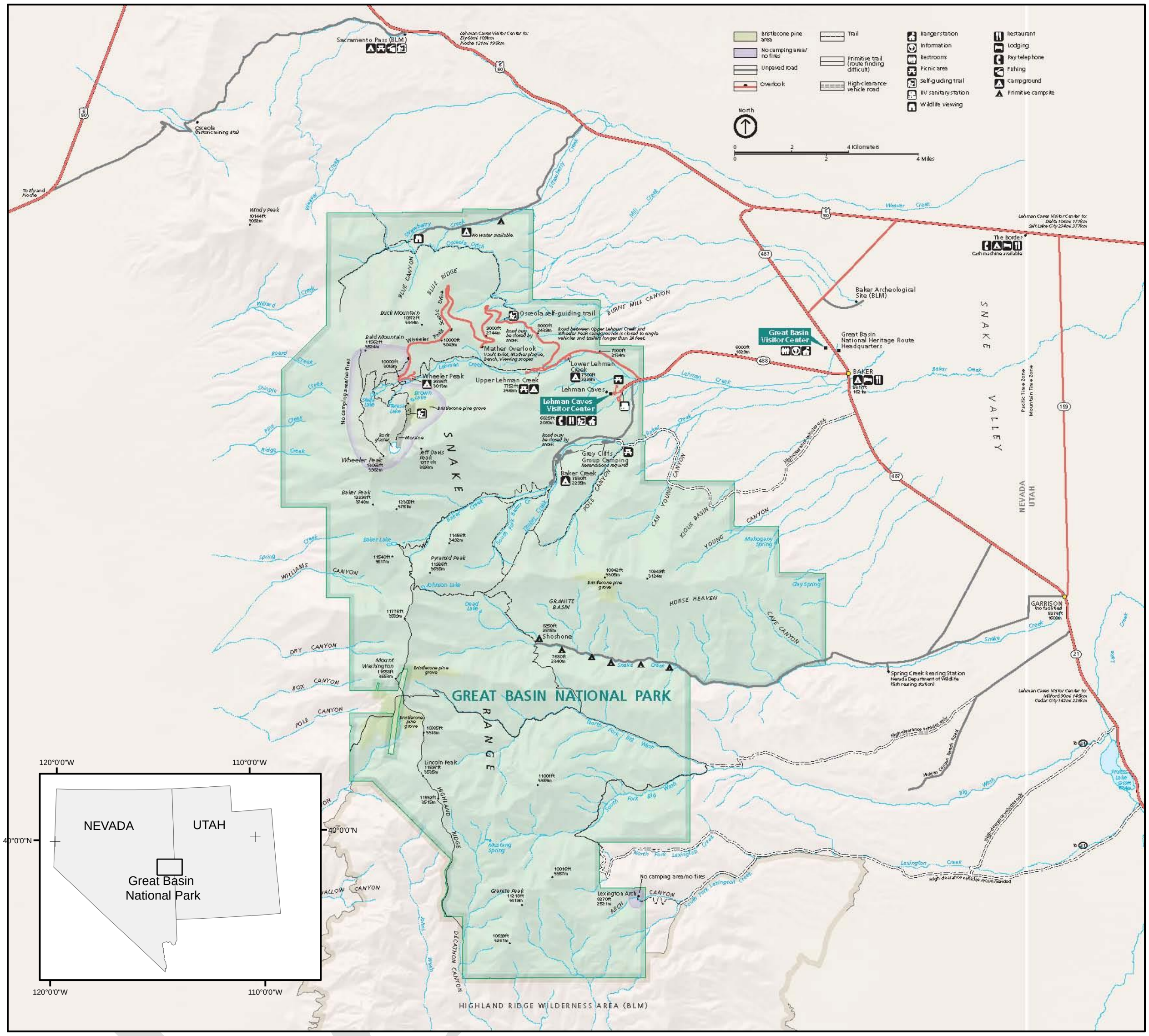


Figure 1. Great Basin National Park is located in east-central Nevada and includes over 77,000 acres in the South Snake Range, as well as 80 acres near the town of Baker used as an administrative site.

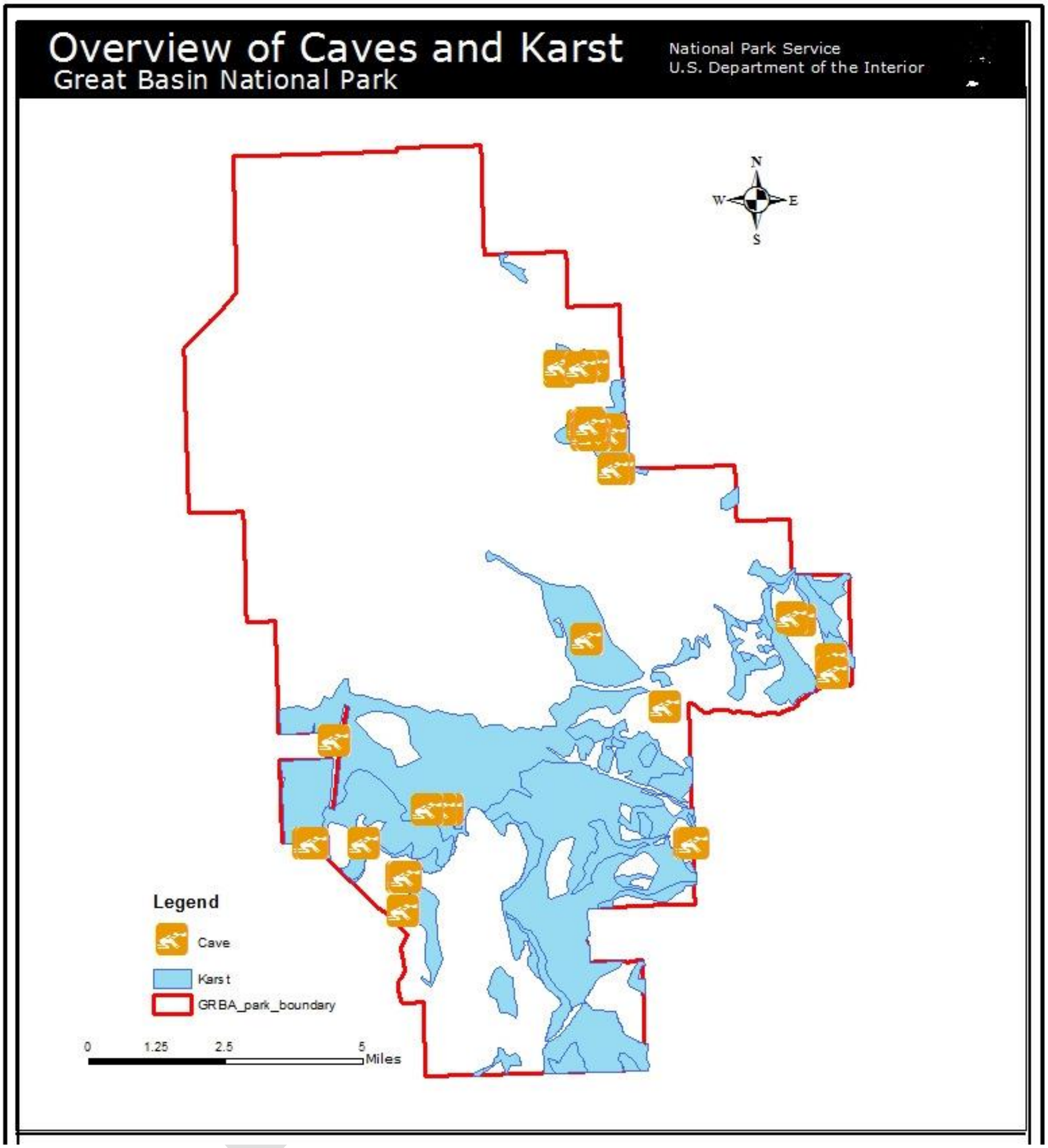


Figure 2. Distribution of caves and karst in Great Basin National Park.

PLAN GOALS

The primary goal of the Wild Caves and Karst Management Plan is to manage the caves and karst in a manner that will preserve and protect cave resources and processes while allowing for respectful scientific use and recreation in selected caves. More specifically, the intent of this plan is to manage wild caves in GRBA to maintain their geological, scenic, educational, cultural, biological, hydrological, paleontological, and recreational resources in accordance with applicable laws, regulations, and current guidelines such as the Federal Cave Resources Protection Act (FCRPA), 43 CFR Part 37, and NPS Management Policies.

Objectives

1. Prioritize safety for both staff and visitors in and out of the caves.

2. Manage and administer cave and karst programs to minimize damage to cave systems. These uses may include land actions (e.g., surface disturbance above or near caves or projects that change the hydrologic systems connected to the cave), research (e.g., archeological or paleontological), recreation, or other uses.

3. Protect and preserve biodiversity by minimizing human disturbance. Maintain connectivity between the surface and sub-surface to provide full access to cave life. Staff works to protect the cave ecosystem from White-nose syndrome and other potential diseases.

4. Manage the cultural landscape and cultural resources of wild caves through documentation and preservation to allow for longevity, preservation, interpretation, and research.

5. Encourage, facilitate, and conduct high-quality scientific study of cave and karst resources.

6. Use partnerships and volunteer resources where feasible to augment park staff resources for inventory, monitoring, surveys, and restoration. Develop and foster communications, cooperation, and volunteerism with interested publics, Federal agencies, Native American Tribes, local governments, and academic institutions.

7. Support cave and karst systems education and outreach.

8. Provide recreational access to selected wild caves in order to provide a high quality visitor experience, while meeting all other management objectives.

RELATED LAWS, LEGISLATION AND MANAGEMENT GUIDELINES

The Lehman Caves Management Plan is consistent with the following documents outlining park management goals and objectives:

- Great Basin National Park Foundation Document (2015)
- Great Basin National Park Resource Management Plan (1999)
- Great Basin National Park General Management Plan (1991)
- Great Basin National Park Legislation (1986)

Additional NPS and federal policy guiding this plan include:

- Federal Cave Resource Protection Act of 1988 (FCRPA)
- National Park Service Organic Act (1916)
- NPS Management Policies (2006)
- National Historic Preservation Act of 1966

- The Archeological Resources Protection Act 1979 (ARPA)
- Native American Graves Protection and Repatriation Act 1990 (NAGPRA)
- National Parks Omnibus Management Act of 1998

A number of specific NPS regulations apply to cave management at GRBA and have been considered in the preparation of the Cave Management Plan. Key regulations include:

- Closures and Public Use Limits (36 CFR 1.5)
- Permits (36 CFR 1.6)
- Preservation of natural, cultural, and archeological resources (36 CFR 2.1)
- Research Specimens (36 CFR 2.5)
- Cave Management (43 CFR 37)

ISSUES AND IMPACT TOPICS

Scoping
A list of issues and concerns related to the project were identified through park internal scoping and through the public scoping process.

ISSUES AND IMPACT TOPICS IDENTIFIED FOR FURTHER ANALYSIS

Based on scoping, the following issues and impact topics were identified and retained for further analysis:

- Biological - Species of Special Concern (Bats, Cave Invertebrates)
- Biological - Non-native species (White-nose syndrome)
- Cultural - Cultural landscapes (Prehistoric/historic structures)
- Cultural - Ethnographic Resources (Museum collections)
- Geological (Bedrock, speleothems, karst)
- Human Health and Safety (Communications, Bad Air, Vertical)
- Socioeconomic/Visitor Use and Experience/Commercial Use
- Research

Civic engagement and public scoping included topics about Cultural Landscapes from local tribes, species of special concern, White-nose syndrome, and socioeconomic concerns.

ALTERNATIVES

INTRODUCTION

This chapter discusses two alternatives (No Action and Proposed Action) for Wild Caves and Karst management at Great Basin National Park. The Proposed Action was developed by an interdisciplinary team of park staff.

DESCRIPTION OF ALTERNATIVES

Alternative 1– No Action Alternative. The No Action Alternative would continue park operations without any major changes. Wild caves and karst would be managed with seasonal access allowed to Little Muddy Cave in the winters. Occasional research would be allowed in some caves. Trespass into Upper and Lower Pictograph Caves would continue at the same or higher levels, depending on overall park visitation levels.

Alternative 2 – Implement Wild Caves and Karst Management Plan. Park staff would meet NPS guidelines and park guidance of having an approved cave management plan for the park. As shown in Table 1, additional cultural resources would be protected and data gaps would be filled. More education about caves would be provided. Additional recreational opportunities in selected caves during selected time periods would be allowed, resulting in a possible increase from 4 to an estimated 20 trips of 3 to 6 people per year total.

Table 1. Summary of Proposed Actions in Wild Caves and Karst Management Plan, Great Basin National Park.

Category	Currently In Place or within Fiscal Year	FY2020-2024	FY2025 and beyond
Safety	• Follow standardized safety protocols • Regularly practice emergency procedures • Nine cave gates • Digging policy • Blasting policy • Bolting policy		• Additional cave gates as needed
Cave Documentation	• New Cave policy • Cave inventory • Cave files		
Biodiversity	• Bat studies • Opportunistic invertebrate monitoring	• Additional bat studies • Vertebrate studies • Directed invertebrate surveys • Paleontological surveys • Promote scientific research	• Additional bat studies • Microbiological surveys
Cultural	• Native Tribes access	• Document cultural resources, including archeological deposits and artifacts, historic inscriptions and artifacts, and ethnographic resources and values • Preserve and interpret Upper and Lower Pictograph Caves • Cultural resource research	
Education and Outreach	• National Speleological grotto presentations/trips • Photos on park social media • Virtual cave tours posted on Park YouTube channel • Park staff trips	• Additional signage • Cave SIM trailer • Webcams of cave entrances/biota	

Category	Currently In Place or within Fiscal Year	FY2020-2024	FY2025 and beyond
	• Recreational trip permitting system • Attend professional symposia/meetings • Use partnerships and volunteer resources		
Recreational Access	• One permit per week during open season • 3-6 people per permit • Trip leader must be 18 years old • WNS decon required • Trip report required • NPS monitoring of rec use caves	• Commercial use allowed • Additional caves allowed for recreational use (See Table 2)	

Category	Currently In Place or within Fiscal Year	FY2020-2024	FY2025 and beyond
Data Gaps		• Finish surveying and mapping selected caves (Baker Creek Cave System, several high elevation caves) • Update all park maps to current cave mapping standards • Complete basic cave inventories where needed • Conduct detailed geologic and/or mineralogical inventories • Complete baseline biological inventories where needed • Conduct repeated biological monitoring at high elevation caves and selected other caves • Conduct additional bat surveys, including internal cave surveys, installation of PIT tag arrays, and acoustical monitoring • Conduct cultural inventories where needed • Conduct paleontological inventories where needed • Encourage scientific research projects that focus on: o Invertebrate natural history o Ice studies o Microbiological studies o Hydrologic studies o Paleontological resources • Complete cave climate study and continue monitoring as needed • Repeat photo monitoring for LAC • Update cave database • Check for cave monuments and install where needed	
Surface Management	• No new development over wild caves • No fire retardant drops over Baker Creek area caves • Follow Integrated Pest Management guidelines		

PRELIMINARY OPTIONS AND ACTIONS CONSIDERED BUT DISMISSED

Options which were inconsistent with NPS policy and mandates, which did not meet the purpose and need of the Wild Caves and Karst Management Plan, which would have severe impacts upon park resources, or which were impossible to achieve due to logistical or technical reasons were eliminated from further analysis. The following options were discussed but dismissed from further consideration:

1. Allowing the public to visit any caves whenever they wanted
2. Closing all wild caves

These options were not given further consideration because they would not allow the park to use the best available science and tools or allow the park to meet its policy mandate and management goals to protect resources for future generations. In particular, allowing the public to visit any caves when they wanted would put biological and cultural resources at risk. It has been shown that caves open to the public without any restrictions are often vandalized. Trampling can put endemic species at risk. Closing all wild caves would not help further the Department of Interior priority to sustainably develop our natural resources or the NPS mission of enjoyment, education, and inspiration of this and future generations. The Proposed Action allows some recreational use while also protecting the caves.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes existing environmental conditions and potential impacts of proposed actions on nine impact categories at Great Basin National Park:

These impact categories were identified through the scoping process as those potentially affected by managing wild caves and karst. Impacts of actions proposed in this environmental assessment are considered for each impact category based on the following:

- Type of impact: beneficial or adverse
- Duration of impact: short-term or long-term
- Intensity of impact: negligible, minor, moderate, or major
- Context of impact: site-specific, park-wide, or regionally

BIOLOGICAL RESOURCES –SPECIES OF MANAGEMENT CONCERN (CAVE INVERTEBRATES)

Affected Environment

Invertebrates have been studied in wild caves in the park starting in the 1950s, with interest from the Desert Research Institute and others. In 1962, Dr. Muchmore described a new pseudoscorpion (an arachnid) from Lehman Caves (Muchmore 1962), which was subsequently found in other caves. Briggs described a new subspecies of harvestman (an arachnid) from Model Cave in 1971 (Briggs 1971); this harvestman was later reclassified as a new species (Derkarabetian and Hedin 2014). Biological inventories from 2003-2007 under the lead of Dr. Steve Taylor and Dr. Jean Krejca found numerous new species to science (Krejca and Taylor 2003; Taylor et al. 2008), including a new genus of millipede, *Nevadesmus ophimontis* (Figure 3). In addition, the range for some known species was extended to multiple caves in high elevation areas. Many of these cave invertebrates are park species of management concern. A summary of cave invertebrates is found in Table 2.

Figure 3. This 0.5-cm long millipede, *Nevadesmus ophimontis*, is found in Lehman and other nearby caves but nowhere else in the world.

Table 2. Selected invertebrates found in wild caves in Great Basin National Park

Common Name	**Scientific Name**	**Caves Where Found**	**Notes**
Lehman Caves Pseudoscorpion	*Microcreagris grandis*	Cave 24, Fox Skull, Lehman, Little Muddy, Model, Root, Squirrel Springs, Water Trough	Endemic to South Snake Range
Model Cave Harvestman	*Sclerobunus ungulatus*	Baker Creek (Ice, Wheelers Deep), Cave 24, Model	Endemic to South Snake Range
Snake Range Millipede	*Nevadesmus ophimontis*	Lehman, Model, Snake Creek	Endemic to South Snake Range; about 10 mm long, all white
Great Basin Cave Millipede	*Idagona lehmanensis*	Baker Creek (Halliday's Deep, Wheelers Deep), Bristlecone, Broken, Lincoln Adit, Model, Squirrel Springs, Water Trough	Endemic to Great Basin National Park; found in caves with water and high elevation; up to 20 mm long and yellowish
Model Cave Amphipod*	*Stygobromus albapinus*	Model	Endemic to Great Basin National Park; prefers groundwater
Globular Springtail	*Pygmarrhopalites shoshoneiensis*	Lehman, Model, Snake Creek	
Root Cave Dark-Winged Fungus-Gnat	*Camptochaeta prolixa*	Lehman, Lehman Annex, Root	Endemic to Great Basin National Park
Pinecone Cave Scuttle Fly	*Aenigmatias bakerae*	Pinecone	Endemic to Great Basin National Park
Lincoln Mine Scuttle Fly	*Megaselia excuniculus*	Lincoln Adit	Endemic to Great Basin National Park
Cave 24 Scuttle Fly	*Megaselia krejcae*	Cave 24	Endemic to Great Basin National Park
Follicle Scuttle Fly	*Megaselia folliculorum*	Cave 24, Lincoln Mine	Endemic to Great Basin National Park
Lehman Cave Scuttle Fly	*Megaselia necpleuralis*	Lehman Caves	Endemic to Great Basin National Park
Cave Cricket	*Ceuthophilus hadeus?*	Cave 24, Lehman, Snake Creek	A definitive identification is still needed
Diplurans	*Family Campodeideae*	Lehman, Model, Root, Water Trough	
Milbert's Tortoiseshell Butterfly	*Aglais milberti*	Broken, Mountain View, Snowcone*	First high elevation cave documentation in Broken

Alternative 1-No Action: Impacts on Cave Invertebrates

Impact Analysis

Under Alternative 1 -No Action, trespass into Upper and Lower Pictograph Caves would continue at the same or higher levels, which impacts cave invertebrates by trampling, unintentionally bringing food into the cave (skin cells, lint, hair), and potentially disturbing cave invertebrate habitat. The Park has photos of people bringing their dogs into these caves, which brings additional adverse impacts. Park staff would continue to sporadically monitor cave invertebrates on trips that are scheduled for other purposes.

Cumulative Impacts
Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter may cause some minor, adverse impacts to cave invertebrates.

Surface activities affect water infiltrating into the cave. Chemicals, nutrients (such as that found in fire retardant), and other toxins occurring in cave water adversely affect underground aquatic life and fauna that drink the water. Dye traces have shown a direct hydrologic link between Baker Creek and some cave passages. Currently water quality is known to be good, with no adverse effects to cave invertebrates.

Conclusion
Not implementing the Wild Caves and Karst Management Plan and continuing under the status quo could result in direct, adverse, long-term, minor, site-specific impacts to cave invertebrates that are species of management concern.

Alternative 2- Proposed Action: Impacts on Cave Invertebrates
Impact Analysis
Under Alternative 2, implementing the WCKMP would result in encouraging additional biological research in the cave, which would help the park better understand the natural history of cave invertebrates. This lack of data hampers management. The Proposed Action would also help cave invertebrates from surface water contamination by increasing awareness and protecting nearby areas from fire retardant drops. Development of interpretive materials outside Upper and Lower Pictograph Caves would reduce the amount of trespass into those caves, and thus the impact to cave invertebrates.

Cumulative Impacts
Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter may cause some minor, adverse impacts to cave invertebrates.

Surface activities affect water infiltrating into the cave. Chemicals, nutrients (such as that found in fire retardant), and other toxins occurring in cave water adversely affect underground aquatic life and fauna that drink the water. Dye traces have shown a direct hydrologic link between Baker Creek and some cave passages. Currently water quality is known to be good, with no adverse effects to cave invertebrates.

Conclusion
Alternative 2, the Proposed Action, would have a direct, beneficial, long-term, minor, site-specific effect to cave invertebrates due to increased knowledge about them, more protection of surface resources, and education of visitors to reduce trespass.

BIOLOGICAL RESOURCES –SPECIES OF MANAGEMENT CONCERN (BATS)

Affected Environment
Bats are critical components of cave ecosystems, their guano and carcasses provide critical subsidies to nutrient limited cave ecosystems. All bats in Great Basin National Park are insectivorous.

Insectivorous bats consume vast quantities of nocturnal insects (such as moths and beetles) estimated to provide $3.7 - $53 billion dollars per year in pest control to agriculture in North America.

Two bat species in the park, Mexican free-tailed (*Tadarida brasiliensis*) and Townsend's big-eared bats (*Corynorhinus townsendii*), are dependent on subterranean habitat for their long term survival (Guild I species; Sherwin et al. 2009). Mexican free-tailed bats are migratory and do not hibernate. A large roost of Mexican free-tailed bats (1-2 million individuals) occurs in summer in Rose Guano Cave, six miles northwest of the park. Mexican free-tailed bats require massive cave openings and large domed ceilings for roosting to accommodate their high wing loading ratio and large populations. No park caves are large enough to support significant populations of free-tailed bats and they are not discussed further.

Townsend's big-eared bats are strictly caverniculous, and subterranean disturbances can result in population level impacts. Past declines in Townsend's big-eared bat populations have been attributed to disturbances in caves (Pierson and Rainey 1998). Recent improvements in cave and mine management, particularly bat-compatible closures and gates, have allowed the species to stabilize and increase in the western US since 1980 (Hammerson et al. 2017). In the park, for example, Townsend's big-eared bats have returned to Lehman Caves due to installation of a bat-compatible cupola on the natural entrance.

Historically, Townsend's big-eared bats likely hibernated exclusively in caves (Sherwin et al. 2009). Currently, the Nevada hibernacula with the largest numbers are in mines, where multiple openings and levels facilitate air flow and cold conditions required for Townsend's big-eared bat hibernation. During hibernation most Townsend's big-eared bats are solitary or clustered in small groups. Townsend's big-eared bats hibernate in the open which makes them highly detectible during winter surveys. Individuals arouse frequently and change locations during the winter. Guano is typically absent from hibernacula. Townsend's big-eared bats tagged at Lehman and Pictograph Caves have been recaptured at hibernacula in Chief Mine and Forgotten Cave, 16 and 11 miles distant from their capture site, respectively. This suggests that hibernacula in the park are limited for the species. Small numbers of Townsend's big-eared bats hibernate in Ice, Crevasse, Hallidays Deep, Systems Key, Lehman, Lincoln Adit, Snake Creek, Model, Upper Pictograph, and Miners Massacre Cave. Baldino (1998) noted 50% decline in hibernating bats was noted in Crevasse and Systems Key caves between 1994 and 1997. This estimate of decline based on two point counts is suspect and underscores uncertainty in methods associated with surveying hibernating bats in the western US. Nevertheless, this report indicates that the Baker Creek cave system has the potential to support significant numbers of hibernating Townsend's big-eared bats.

Male and female Townsend's big-eared bats separate for much of the summer. Males are less dependent on caves than females and summer in cooler roosts in cracks and crevices to conserve energy via daily torpor. Females emerge from hibernation and move to warmer roosts for gestation and pup rearing. Gestation and maternity roosts are often located at cave entrances, in the twilight or sunlit zones, where warmer temperatures facilitate growth of pups. To save energy and conserve heat, females and pups form clusters in maternity roosts. Unlike hibernacula, maternity roosts are identifiable by fresh guano, which accumulates under clustered bats. Young bats can fly at two and a half to three weeks of age and are fully weaned by six weeks age. Maternity colonies break up in August.

Roost switching is an important and poorly understood aspect of the life history of Townsend's big-eared bats. During maternity season, roost switching occurs in response to variety of stimuli. For example, females sometimes carry their young to new caves after human disturbance. Females actively thermoregulate, choosing optimal temperatures and microclimates for gestation, parturition, and pup rearing. Variable surface and cave temperatures may play a role in roost switching. When pups become volant, the entire colony may move to cooler roosts to minimize energy expenditure. A key aspect of management for Townsend's big-eared bats is that even apparently unused caves may provide habitat in the future.

Figure 4. Cluster of approximately 25 Townsend big eared bats. Clusters typically form to maximize thermal environment for developing pups. Photo by Joseph Danielson.

Alternative 1-No Action: Impacts on Bats

<u>Impact Analysis</u>
Under the No Action alternative, bats would continue to be monitored by park staff, through acoustic monitoring, roost surveys, and PIT tag arrays. The park would maintain bat partnerships with Nevada Department of Wildlife, Bureau of Land Management, academic partners, and Nevada Bat Working group. PIT tag arrays would continue to operate and data would be downloaded monthly. Bats would continue to be monitored in park caves through roost surveys and acoustic roost loggers to document high frequency echolocation calls and bat distribution caves. Trespass into Upper Pictograph Caves would continue at the same or higher levels, negatively impacting roosting Townsend's big-eared bats.

<u>Cumulative Impacts</u>
Infrequent resource management trips may cause some adverse, negligible impacts to bats due to unintentional disturbance.

<u>Conclusion</u>
Not implementing the Wild Cave and Karst Management Plan and continuing under the status quo could result in continuation of indirect, adverse, long-term, minor, site-specific impacts to Townsend's big eared bats, a species of management concern. Townsends big eared bats seem to be

increasing locally and wild caves within GRBA are an important habitat for these metapopulations, used as a maternity roost, transitional habitat, night roost and hibernacula. Currently bat use is widespread in GRBA's wild caves. A key aspect of management for Townsend's big-eared bats is that even apparently unused caves may provide habitat in the future.

Alternative 2- Proposed Action: Impacts on Bats

Impact Analysis

Implementation of the proposed action would have some direct, adverse, long-term, negligible, site-specific impacts on bats. Recreational caving would be limited to seasons outside hibernating and pupping for Townsend's big-eared bats. This would avoid any population level impacts, any impacts by recreation would be limited to individual bats. Development of interpretive materials outside Upper and Lower Pictograph Caves would reduce the amount of trespass into those caves, and thus reduce the impacts to roosting bats, resulting in a long term, beneficial, minor impact.

Cumulative Impacts

Infrequent resource management trips may cause some adverse, negligible impacts to bats due to unintentional disturbance.

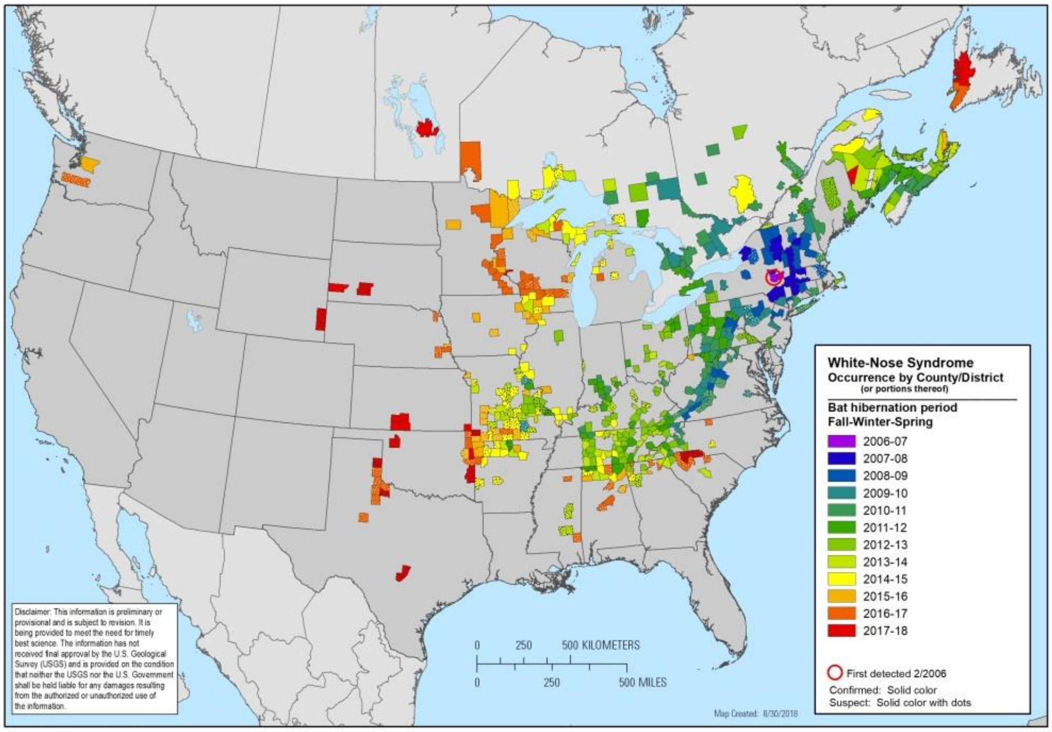
Conclusion

The WCKMP will encourage continued and additional research on bats, which would help the park better understand the roosting switching, thermal preferences, and metapopulation dynamics of Townsends big eared bats. Recreational caving could have direct, adverse, long-term, negligible, park-wide impacts to Townsend's big-eared bats.

BIOLOGICAL-NON-NATIVE SPECIES (WHITE-NOSE SYNDROME)

Affected Environment

White-nose syndrome (WNS) is a disease in bats caused by the fungal pathogen (*Pseudogymnoascus destructans*, Pd). WNS has caused mortality rates of up to 100% in some bat populations and has killed over 5.7 million bats in the eastern United States. WNS likely arrived in New York State from Europe in 2007 and has spread as far west as Washington state. Predictive models suggest WNS could arrive in the park by 2025 (Maher et al. 2012; Ihlo 2013). The park currently does not allow any clothing, footwear, or gear that has been in a county with WNS to enter any wild caves. Clothing, footwear, and gear that has been in caves in non-WNS areas must be decontaminated before entering any park caves, and between trips in any park caves. Visitors to Lehman Caves are screened for visits to caves and mines. If visitors have been in caves or underground mines in areas of documented WNS, their clothing and other items are decontamined before they enter Lehman Caves. The park follows the latest USFWS protocols, available at: https://www.whitenosesyndrome.org/topics/decontamination .



Citation: White-nose syndrome occurrence map - by year (2018). Data Last Updated: 8/30/2018. Available at: https://www.whitenosesyndrome.org/resources/map.

Figure 5. Current map of White Nose Syndrome documentation by county and year in the United States. Map is current as of 28 September 2018 and updated regularly at https://www.whitenosesyndrome.org/

Alternative 1-No Action: Impacts on White-Nose Syndrome

Impact Analysis

Under Alternative 1 -No Action, wild caves would remain closed to recreation except for Little Muddy Cave. Park employees would continue to follow WNS decontamination protocols. Currently WNS is not found in the park so there are no impacts to bats. In spite of strict adherence to decontamination protocols and guidelines, Pd, the fungal pathogen causing WNS, travels at a rate of approximately 500 miles per year, transported by movements of bats, which can disperse hundreds of miles during migration. Eventually when Pd arrives at GRBA, the impacts and susceptibility of park bats to WNS will have to be reassessed. When Pd arrives, decontamination of visitors and park staff leaving wild caves may be warranted to minimize the rate of spread of WNS to uncontaminated regions.

Cumulative Impacts

Infrequent resource management trips may cause some negligible impacts to WNS due to unintentional disturbance.

Conclusion

Impacts of the no action alternative to WNS would be indirect, adverse, long-term, negligible, and park-wide.

Alternative 2- Proposed Action: Impacts on White Nose Syndrome

Impact Analysis

Although Pd has thus far only been shown to be transported by bats, recreational cavers are a potential vector of WNS. The proposed action would increase the probability of transmission of WNS to park caves. This probability would be minimized by following the latest USFWS protocols, available at: https://www.whitenosesyndrome.org/topics/decontamination . The park currently does not allow any clothing, footwear, or gear that has been in a county with WNS to enter any wild caves. Clothing, footwear, and gear that has been in caves in non-WNS areas must be decontaminated before entering any wild cave, and between trips in any park caves.

Cumulative Impacts

Infrequent resource management trips may cause some negligible impacts to WNS due to unintentional disturbance.

Conclusion

Impacts of the proposed action alternative to WNS would be indirect, adverse, long-term, negligible, and park-wide.

CULTURAL-CULTURAL LANDSCAPES (PREHISTORIC/HISTORIC ARCHEOLOGICAL RESOURCES, HISTORIC STRUCTURES)

Affected Environment

The caves and cave systems have provided a setting for cultural activity in the prehistoric through the historic past. Individual cave sites have been explored, but evaluation of caves as a Cultural Landscape has not been done. Archeological investigation of caves in the area began in the 1920s and 1930s when a primary interest was to find and explore evidence of "early man" in Nevada. Archeological studies involved work in the Baker Creek Pictograph Caves where artifacts found were in poor condition. Further work was discouraged due to preservation problems in the damp environment.

From the 1970s and 1980s other researchers surveyed the area under direction of the U.S. Forest Service. Snake Creek Cave was visited and artifacts were collected with only brief mentions in reports. After creation of Great Basin National Park, the Western Archeological Conservation Center (WACC) investigated and noted cultural components for only four caves including Lehman Caves. Other caves were noted but not tested for artifacts.

Historic period exploration or use of caves is notable with dated inscriptions and historic artifacts found in some areas.

Alternative 1- No Action: Impacts on Cultural Landscapes (prehistoric/historic archeological resources and historic structures)

Impact Analysis

Under Alternative 1 -No Action, current cave activities affecting cultural landscapes (prehistoric/historic archeological resources and historic structures) will continue. Cultural resources are a finite non-renewable resource, once damaged they cannot be replaced. Unregulated cave tours and recreation use have a negative impact. Soil disturbance from walking, crawling, and climbing damages context of potential buried cultural deposits. Historic inscriptions can be directly damaged by touching, rubbing, scraping or climbing. Currently there are no specific guidelines to protect the cultural landscape. Under this alternative, direct, adverse, long-term, minor, site-specific impacts are expected to continue.

Cumulative Impacts
Cumulative impacts to cultural landscapes (prehistoric/historic archeological and historic structures) may cause permanent loss of cultural landscape resources. Each damage incident reduces the overall archeological information and historic value and landscape nature of cave use. Continuing the current practices will result in direct and indirect, adverse, long-term, moderate, site-specific impacts.

Conclusion
Under current practices there is no scientific information for identifying carrying capacity and resource protection. Issuing cave activity permits on a case-by-case basis does not provide adequate protection for the cultural landscape. Current practices have a negative impact on the cultural landscape. These impacts are irreversible, therefore continuing these practices will result in direct, adverse, long-term, moderate to major, site-specific impacts to the cultural landscape (prehistoric/historic archeological resources and historic structures).

Alternative 2- Proposed Action: Impacts on Cultural landscapes (prehistoric/historic archeological resources and historic structures.

Impact Analysis
Under Alternative 2, implementing the WCKMP would result in improved documentation of the cultural landscape including both the prehistoric and historic archeological components. The desired future condition for cultural resources in wild caves is to inventory and protect them throughout the park. This includes protection and restricted access for identified caves. Documenting resources and current impacts to cultural resources will provide baseline for monitoring and condition assessment to protect sensitive resources.

Cumulative Impacts
Cumulative impacts to cultural landscapes (prehistoric/historic archeological and historic structures) may cause permanent loss of cultural landscape resources. Each damage incident reduces the overall archeological information and historic value and landscape nature of cave use. Continuing the current practices will result in direct and indirect, adverse, long-term, moderate, site-specific impacts.

Conclusion
Overall, implementing the WCKMP, which would call for the complete documentation of the historic landscape (prehistoric/historic archeological resources and historic resources), and consideration of those resources when establishing guidelines for use, and special permitting proposed in Alternative 2 would result in direct, beneficial, long-term, moderate, site-specific impacts to the cultural landscape (prehistoric/historic archeological resources and historic structures).

CULTURAL-ETHNOGRAPHIC RESOURCES

Affected Environment
The South Snake Mountain Range is recognized by area Shoshone, Goshute, and Paiute Tribes as part of their cultural use area. Both the physical and spiritual aspects of caves hold great importance

for the Tribes and are ethnographic resources. Some aspects of cave importance are only discussed among appropriate Tribal people.

Some caves in the area are known to hold burial remains. In two area caves including one in the park, remains that were removed have been returned for repatriation.

Alternative 1- No Action: Impacts on Ethnographic resources.

Impact Analysis

Under Alternative 1 -No Action, current cave activities affecting ethnographic resources are expected to continue. Caves would continue to be used for research and recreational purposes. Trespass would continue into Upper and Lower Pictograph Caves. Current impacts are indirect and direct, adverse, long-term, minor, and site-specific. Under this alternative there would be no change.

Cumulative Impacts

Cave activities and associated disturbance are ongoing impacts. These impacts are indirect and direct, adverse, long-term, minor, and site-specific for the ethnographic resource.

Conclusion

The no action alternative would continue current practices. Ethnographic resources would continue to experience negative indirect impacts from cave activities. Soils potentially containing ethnographic resources or burial remains may be disturbed by activities causing direct, adverse, long-term, localized minor impacts. Overall, the no action alternative would result in indirect and direct, adverse, long-term, minor, site-specific impacts.

Alternative 2- Proposed Action: Impacts on Ethnographic resources.

Impact Analysis

Under Alternative 2, implementing the WCKMP, ethnographic resources will be identified. The cultural inventory will provide baseline for evaluation, consultation, and protection. If burial remains are found in any of the caves during documentation, appropriate steps will be taken. Conditions can be monitored and activities will be restricted when warranted. These actions are expected to provide better protection for ethnographic resources and impacts will be direct and indirect, beneficial, long-term, minor, and site-specific.

Cumulative Impacts

Cave activities and associated disturbance are ongoing impacts. These impacts are indirect and direct, adverse, long-term, minor, and site-specific for the ethnographic resource.

Conclusion

Under Alternative 2, the WCKMP would be fully implemented. Ethnographic resources will be identified. The cultural inventory will provide baseline for evaluation, consultation, and protection. Conditions can be monitored and activities will be restricted when warranted. Overall this alternative would have direct and indirect, beneficial, long-term, minor, site-specific impacts.

CULTURAL- MUSEUM COLLECTIONS

Affected Environment
The National Park Service collects, protects, and preserves objects, artifacts, specimens, and archives and makes them available for use in research. Wild caves have research potential with prehistoric and historic artifact deposits, biological and geological resources. Any items collected and removed from caves, reports and data generated through cave studies, are entered in the museum collection and archives. All items remain property and responsibility of the National Park Service. Care of specimens and archives requires space and curatorial staff to maintain conditions and records for all collections. Museum collections from the cave are housed in the park curatorial space, at Western Archeological Conservation Center (WACC), an NPS repository, and on loan to various university research institutions.

Alternative 1- No Action: Impact on Museum collections.
Impact Analysis
Under Alternative 1 -No Action, current cave activities that affect museum collections would continue. Artifacts collected and reports and data generated in cave activities and research, add to the museum collection volume. Overcrowding in museum space has a negative impact on collections care. Due to space and staff limitations, this alternative will continue to have a direct, adverse, long-term, minor, long-term, site-specific impacts on museum collections.

Cumulative Impacts
Museum collections from the caves will accumulate. This will continue to have indirect, adverse, long-term, minor, site-specific impacts to museum collection capacity and care.

Conclusion
Alternative 1 – No Action will continue current practices that do not take long term storage and staffing requirements for museum collections into consideration. Museum overcrowding and lack of staffing will have indirect, adverse, long-term, minor, site-specific impacts on museum collections.

Alternative 2- Proposed Action: Impact on Museum collections.
Impact Analysis
Under Alternative 2- Proposed Action the WCKMP will be fully implemented. This plan calls for inventory and monitoring protocols, encourages more scientific research that will produce data and may recover artifacts. All of these activities add to space and staffing needs for the museum collections. There is no current plan to increase space or staffing to meet these needs, therefore this alternative will have indirect, adverse, long-term, minor, site-specific effects on museum collection conditions.

Cumulative Impacts
Museum collections from the caves will accumulate. This will continue to have indirect, adverse, long-term, minor, site-specific impacts to museum collection capacity and care.

Conclusion
Alternative 2 will result in increased museum archive collection and artifact collection. Current museum space and staffing will not provide adequate care for current and increasing collections. Therefore, this alternative will have indirect, adverse, long-term, minor, site-specific impacts for museum collections.

GEOLOGIC RESOURCES (BEDROCK & SPELEOTHEMS)

Affected Environment
Geologic Resources in the project area likely to be impacted consist primarily of carbonate bedrock, karst, and speleothems.

Bedrock
The southern Snake Range consists of a vast array of rock types and ages. Of primary interest for this document are the carbonates where caves are found. Caves formed primarily in the following Paleozoic rock layers: the Cambrian-age Pole Canyon Limestone, the Cambrian Lincoln Peak Formation, the late-Cambrian Notch Peak Limestone, the late-Cambrian to Ordovician House Limestone, and the Devonian Guilmette Formation (Figure 3).

Many of the caves in the park are located in the Cambrian-age (541 to 485 million years ago (mya)) Pole Canyon Limestone, which is located on the fringes of the Snake Range at about 6,500 feet elevation. This limestone layer once covered the entire area, but today is only found in the park along the eastern border, the middle section of Snake Creek, most of the North Fork Big Wash drainage, Mount Washington, and near the South Forth Big Wash trailhead (Drewes and Palmer 1957, Hose and Blake 1976, Miller et al. 2007). The limestone can be found in units up to 1840 ft. (557 m) thick. This and other Cambrian age units were deposited when the area was a shallow and nearshore marine environment (Drewes and Palmer 1957).

The bedrock is very heavily fractured with abundant joints and faults in the walls and ceilings (Hose 2018a).

Karst
Karst terrain is permeable rock that can have a variety of cave-forming processes active within it. These processes can be cave springs, sinkholes, sinking streams, and more (Figure 6). Over 40,000 acres of karst terrain is present in GRBA.

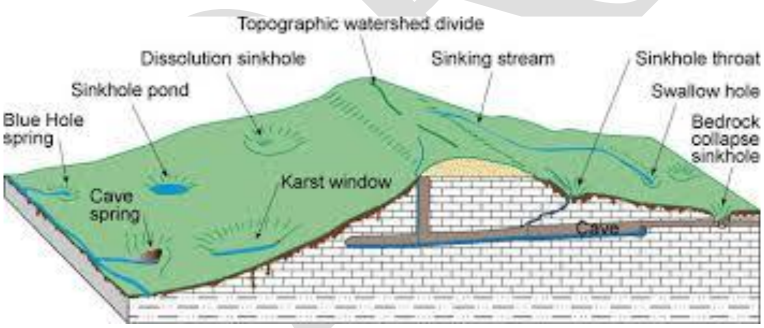


Figure 6. Image of karst terrain. From Kentucky Geological Survey.

Speleothems
The caves in GRBA is known to contain a wide variety of and abundant speleothems
Many speleothems are made of calcite ($CaCO_3$). Pool deposits, where calcium carbonate usually crystallizes as calcite, include rimstone, shelfstone, folia, and cave rafts. Flowing and dripping water create gravitationally influenced speleothems of calcite and include cave pearls, flowstone, stalactites, soda straws, stalagmites, columns, and draperies. Speleothems formed by capillary water include helictites, anthodites, shields, and welts (including bulbous stalactites). Evaporative

speleothems such as coralloids (cave popcorn is the most common example), frostwork, and gypsum crusts are present in Lehman Caves. Speleothems influenced by microbial activity include moonmilk (Hill and Forti 1997, Palmer 2007).

The biggest growth period for speleothems has been determined by research. "Dennison (2007) used uranium-series dating techniques to determine the age of dozens of stalagmites within Lehman Caves. His dates ranged from 7740 to 466,600 years old with the majority of dates between about 125ka and 250ka, associating most calcite speleothem growth with "full glacial and full interglacial periods" in the Pleistocene. One stalagmite date by Lachniet and Crotty (2017) is 2.21 Ma old, representing at least some calcite speleothem growth as early as the Pliocene. It appears that very little calcite speleothem growth has occurred since the Pleistocene. An exception is likely to be the abundant cave coral that is probably associated with condensation-corrosion processes and has grown (and, perhaps, still grows) from seasonal condensation" (Hose 2018b).

Hose (2018b) continues: "Research has shown that these speleothems do not grow at an even pace, and that gaps of tens of thousands of years in growth are possible (McGee 2011). Over time, some speleothems lose their color and luster. This often occurs due to drying, which can cause the disintegration of the crystal structure of the speleothem. Bacteria can also break down calcite, often forming moonmilk in the process. Condensation-corrosion can cause speleothems to be worn down where carbon dioxide content is high, with a chalk-white speleothem remaining. Just as oversaturated waters create speleothems, undersaturated water can dissolve them away (Hill and Forti 1997). Speleothems in many different states of formation and dissolution are present in Lehman Caves."

Alternative 1-No Action: Impacts on Geologic Resources

Impact Analysis

Under Alternative 1, No Action, the geologic resources of bedrock, karst, and speleothems would continue to be little-studied and for the most part, not managed. Occasional resource management and recreational trips may cause a small impact to geologic resources.

Cumulative Impacts

Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter may cause some minor, adverse impacts to geologic resources, particularly to damaging speleothems.

Conclusion

Not implementing the Wild Caves and Karst Management Plan and continuing under the status quo could result in direct, adverse, long-term, negligible, and site-specific impacts to geologic resources of bedrock, karst, and speleothems.

Alternative 2- Proposed Action: Impacts on Geologic Resources

Impact Analysis

Under Alternative 2, the Proposed Action, more research would be encouraged for geologic resources. Additional recreational trips would be allowed, with an estimated increase from 4 to 20 trips per year, which could have more impact on speleothems. Recreational cave permits stress cave conservation. In addition, the premittees have to meet with the park's cave specialist to pick up the cave key and learn more about cave conservation. Conducting more detailed inventories of wild caves would allow cave managers to better understand the resources they are trying to protect.

Cumulative Impacts

Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter may cause some minor, adverse impacts to geologic resources.

Conclusion

Alternative 2, the Proposed Action, would result in direct, adverse, long-term, minor, and site-specific impacts to geologic resources of bedrock, karst, and speleothems.

HUMAN HEALTH AND SAFETY

Affected Environment

Human health and safety in GRBA caves is a high priority. The primary issues relating to human health and safety for wild caves are lack of communications while underground, high carbon dioxide levels in Little Muddy Cave during the summer, vertical components to some of the caves, and flooding in select caves. Over the past decade, the safety record for these caves has been excellent. One incident occurred during a vertical trip with hair being stuck in a descent device, but due to the training of participants, it was solved in five minutes.

Communication with the surface while underground is extremely difficult, if not impossible. Cell phones and satellite communication devices do not work. Radios will only work if there is a small amount of rock between the passage where the radio is being used and the outside. In order to mitigate this lack of communication, cave trips are required to have three to six people on them, so if one person is injured, one person can stay with the injured person and the rest can go for help. In addition, cave trips are required to have a surface contact and leave a return time to contact them. If the group is not out by the return time, the surface contact calls emergency resources to come and check on the caving group. Generally communication within the cave group can be done by voice, although in some noisier passages due to water, whistles may be preferable.

High carbon dioxide levels are known to occur in Little Muddy Cave. While not dangerously high, they have caused headaches in cavers. For that reason, access to Little Muddy Cave is restricted to the winter months, when carbon dioxide levels are low.

About one-third of the known caves in Great Basin National Park have vertical components, ranging from a few feet to 200 feet in a single pitch. Long Cold Cave is the deepest cave in the state of Nevada, at 436 feet deep, reached by multiple rappels. Anyone going into one of these vertical caves needs to have vertical experience. Park staff and volunteers must show the capability to ascend and descend while in control using standard caving gear. They must also complete a changeover from ascent to rappel while on rope. Recreational cavers must provide a caving resume, which includes which vertical caves they have done and the length of drops in them.

Flooding does not usually happen quickly in any of the park caves. Model Cave is sumped at the water table, which fluctuates over 100 feet each year. This moving water table may be called flooding, but it happens at a pace slow enough that cavers could crawl away from the rising waters. Park staff do not enter sumps.

High elevation caves have cold temperatures and for two have year-round ice. They are also at high elevation, so that oxygen is less abundant. For visits to these caves, cavers need to be prepared with appropriate clothing and acclimatization.

Tight spaces are common in many of the park caves. For Little Muddy, a concrete block is located behind the Lehman Caves Visitor Center. Those with permits to Little Muddy Cave are encouraged to go through the block to make sure they will fit through the squeeze in the main passage. There are, however, many tighter passages in Little Muddy and many other park caves. Cavers must exercise caution when entering small passages so that they can get out of them. The park does have a microblasting kit in the rescue cache in case of someone getting stuck in one of these tiny passages.

Great Basin National Park maintains a gear cache for cave rescue. It also conducts regular cave rescue training in case of emergency, and maintains a cave rescue call out list.

Alternative 1- No Action: Impacts on Human Health and Safety

<u>Impact Analysis</u>
Under the No Action Alternative, no changes would be made for human health and safety. Park staff would continue to conduct JHAs and/or GARs prior to caving trips. Recreational trips into Little Muddy Cave would continue, with permittees receiving a safety message.

<u>Cumulative Impacts</u>
Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter have minimal impacts on human health and safety.

<u>Conclusion</u>
Not implementing the Wild Caves and Karst Management Plan and continuing under the status quo could result in direct, adverse, short-term, negligible, and site-specific impacts to human health and safety.

Alternative 2- Proposed Action: Impacts on Human Health and Safety

<u>Impact Analysis</u>
With recreational use permitted at additional caves, more people would be entering the cave environment. Filling data gaps would necessitate visiting more caves by park staff. Whenever more people do any activity, there is a higher risk for incidents. However, safety would be stressed before all cave trips are permitted. Before recreational permits are issued, trip leaders need to show that they have experience leading safe caving trips, including ensuring that all participants have proper PPE, experience, and ability for the cave. The park will also invite trip leaders to participate in cave rescue practices. Park staff will be encouraged to attend National Cave Rescue Commission training.

<u>Cumulative Impacts</u>
Infrequent resource management trips and one to two recreational trips into Little Muddy Cave each winter have minimal impacts on human health and safety.

Conclusion
Alternative 2, the Proposed Action, would result in direct, adverse, long-term, minor, and site-specific impacts to human health and safety.

SOCIOECONOMIC/VISITOR USE AND EXPERIENCE/COMMERCIAL USE

Affected Environment
Currently visitors can only go into Lehman Caves on a ranger-guided tour and can take self-guided trips in Little Muddy Cave during the winter months with a recreational cave permit. About 4 trips per year enter the cave. The WCKMP would allow for expanded access, with an estimated 20 trips per year to the permitted caves.

Visitation to the park has been increasing, therefore demand for cave tours in Lehman Caves has increased and requests for other cave to explore has increased because tours are full nearly every day during the summer months. From 2013 to 2017 park wide visitation has increased 81%.

Guided tours conducted by commercial use permit holders will provide access to wild caves for less experienced cavers. Virtual tours for all types of visitors would allow many more visitors to access the cave without impacting the cave.

Alternative 1-No Action: Impacts to Socioeconomics/Visitor Use and Experience/Commercial Use

Impact Analysis
Under Alternative 1 -No Action, visitors would continue to have little access to wild caves in the park.

Cumulative Impacts
Visitation to the park is expected to increase. Visitors want to have expanded opportunities to know their park.

Conclusion
No action would have indirect, adverse, long-term, minor, park-wide impacts to socioeconomics, visitor use and experience, and commercial use.

Alternative 2- Proposed Action: Impacts to Socioeconomics/Visitor Use and Experience/Commercial Use

Impact Analysis
Under Alternative 2, implementing the WCKMP would result in increased access to public lands, a goal of the Department of Interior. An estimated additional 16 cave trips per year would enter permitted caves. This wild cave experience provides for different park experiences by visitors. Research is finding visitors enjoy self-guided/self-determined experiences.

This Alternative also has the potential to increase the length of a visitor’s stay in the area. Longer stays and more activities can increase business in the local area.

The addition of an interpretive platform at Upper and Lower Pictograph Caves would give visitors with limited mobility a chance to see into a cave and connect with cultural resources (pictographs) of the cave. If funded, this would have additional NEPA done.

Long-term, the opening of easy and technical caves to visitors will have positive impact on visitor experiences and potentially the regional economy as visitors may stay in the region longer. This plan provides more access to public lands and increased connections between the park resources and park visitors, developing park stewards who care about the caves. It also helps continued friendly working relationships with local tribes through mutual work to share past native cultural resources.

Cumulative Impacts

Visitation to the park is expected to increase. Visitors want to have expanded opportunities to know their park.

Conclusion

Implementing the Plan will have direct, beneficial, long-term, minor, park-wide impacts to socioeconomics, visitor use and experience, and commercial use.

RESEARCH

Affected Environment

Many data gaps still exist for wild caves in GRBA. High-quality scientific study of cave and karst resources in all disciplines is desired. *NPS Management Policies* (NPS, 2006 § 4.8.2.2), articulates service wide policy consistent with Federal Cave Resource Protection Act, “Some caves or portions of caves may be managed exclusively for research, with access limited to permitted research personnel.” A variety of research has been conducted in park caves. All researchers working in the park are required to have a valid NPS Scientific Research and Collecting Permit. Often, park staff accompany researchers into park caves to ensure cave conservation.

Past hydrologic research has focused on the Baker Creek Cave System and additional work is needed. Biological research has discovered new species throughout the park, primarily macroinvertebrates. Ongoing bat research of caverniculous bats is largely focused on maintaining maternity and hibernating colonies of Townsend’s big-eared bats found in several caves. This species has been historically considered sensitive to human disturbance, particularly maternity colonies which have been shown to abandon roosts in response to disturbance. More microbiological research is needed.

All cultural resource related research requires an NPS scientific research permit, Antiquities permit, and ARPA permit. Cultural permits are authorized by the PWR Regional Director. In addition requests that include excavation and/or collection require Section 106 compliance and a signed repository and loan agreement for artifacts recovered. Artifacts and all field notes remain property of NPS.

Alternative 1- No Action: Impacts to Research

Impact Analysis
Under the No Action Alternative, research in caves would continue to a limited degree, primarily bat research by park staff. No emphasis would be put on filling data gaps in caves and no target cave research outreach would occur. Besides bats, no additional research knowledge would be likely gained for macroinvertebrates, hydrology, microbes, or cultural resources.

Cumulative Impacts
Sporadic research permits are currently issued for cave and karst work, resulting in limited knowledge.

Conclusion
Alternative 1, No Action, would result in indirect, adverse, long-term, minor, and park-wide impacts to research.

Alternative 2- Proposed Action: Impacts to Research
Alternative 2 would encourage, facilitate, and conduct high-quality scientific study of cave and karst resources. Any studies will be completed with minimal impact to caves. Any research and collection requests will be handled through the NPS Scientific Research and Permitting System, available online (https://irma.nps.gov/rprs/). Park staff will review applications, and if they meet park criteria, will be forwarded to the Park Superintendent or designee for approval. Cave-specific criteria include that intact speleothems will not be broken; for biological studies, a limited number of biota may be taken; and for all in-cave research, minimum impact techniques will be used. All researchers will be accompanied in the cave by park personnel or designee for their research. As for all research in the park, copies of researchers' notes and all publications must be submitted to the park. In addition, the researchers must complete a trip report for each cave visit and an Investigators Annual Report. Cave management decisions will be based on the most current knowledge and science available. If new knowledge or research shows a different result than what is in the plan, the plan will be modified.

Impact Analysis
Under Alternative 2, research will be encouraged and facilitated. Additional knowledge is likely to be gained on hydrology, macroinvertebrates, microbes, cultural resources, and cave ecology in general.

Cumulative Impacts
Sporadic research permits are currently issued for cave and karst work, resulting in limited knowledge.

Conclusion
Alternative 2, the Proposed Action, would result in indirect, beneficial, long-term, minor, and park-wide impacts to research.

CONSULTATION AND COORDINATION

SCOPING

Internal Scoping

Internal scoping began with an interdisciplinary team meeting in December 2015. Periodic meetings were held through April 2016 to determine content of the plan. Meetings were also held in February and March 2017 and May 2018 to discuss moving the plan forward and NEPA direction.

Public Involvement

Civic engagement to draft the Wild Caves and Karst Management Plan (not the EA) was held from January 13, 2016 to February 26, 2016. Several tribes commented (see below). Public scoping for the Proposed Action, the draft Lehman Caves Management Plan was held May 15 to June 14, 2019. Three public comments were received. One greatly improved the geologic section of the document. A public meeting and site visit were held June 3, 2019 at Lehman Caves. Six members of the public attended. Substantive comments were incorporated.

CONSULTATION

Advisory Council on Historic Preservation and Nevada State Historic Preservation Officer
The undertakings described in this document are subject to Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC Section 470 et seq.). Consultations with the Nevada State Historic Preservation Office (SHPO) were initiated May 2019.

Tribes
On April 21, 2016, three Tribes, Duckwater, Ely, and Confederated Tribes of Goshute, met with Great Basin National Park personnel to discuss the Wild Caves and Karst Management Plan. They supported the plan and provided pertinent information.

U.S. Fish and Wildlife Service
No state or federally listed or candidate species are found in the project area, thus no consultation was needed with the USFWS.

Army Corps of Engineers
No construction was planned in any wetlands or floodplains, thus no consultation was needed with the Army Corps of Engineers.

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There will be a 30-day comment period on the EA. Comments may be submitted online at: http://parkplanning.nps.gov/wckmp, or in writing to the following address:

Planning
Great Basin National Park
100 Great Basin National Park
Baker, NV 89311

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

NPS 611/101091 March 2010

United States Department of the Interior □ National Park Service